

SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
			INTERVALVE (INDIA) LTD.	Pune	Steel ball Valves upto 50NB, #800 and 65NB to 150NB. #150	
			NILON VALVES PRIVATE LIMITED	Ahmedabad		
			LEADER VALVES LTD.	Jalandhar	CAST STEEL UPTO 200 MM, CLASS 150/300.	
			DEMBLA VALVES LTD.	Thane		
			SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai	FOR CARBON STEEL/STAINLESS STEEL UPTO SIZE 200NB.	
			UNIFLOW	Chennai		
			VALTECH INDUSTRIES	Mumbai	FORGED CARBON & ALLOY STEEL BALL VALVES, SCREWED TYPE BALL VALVES RATING 800, SIZES UPTO 50 & CC & ALLOY STEEL BALL VALVES RATING 150, SIZES 65 TO 200 FLANGED TYPE.	
			VAAS AUTOMATION	NEW DELHI		
			Belgaum Aqua Valve	Belgaum		
6	CS/FS Gate/Globe/Check valves	III	Fouress	Mumbai/ Aurangabad		
			Weir BDK	NEW DELHI		
			L & T Valves	Coimbatore/ Kancheepuram		
			Leader	Jullundhar		
			KSB	Coimbatore		
			A V Valves	Agra		
			ATAM Valves	Jalandhar	(1) Carbon Steel Gate Valves & non return valves: 15 NB to 50 NB (#800) & 65 NB to 300 NB (#150) (2) Carbon Steel Globe Valves: 15 NB to 50 NB (#800) & 65 NB to 200 NB (#150)	
			Fluidline valves	Ghaziabad		
			GM ENGINEERING	Rajkot		
			INTERVALVE (INDIA) LTD.	Pune	a) Steel Gate Valves: upto 50NB, #800 and 65NB to 150NB, #150 b) Steel Globe Valves: upto 50NB, #800 and 65NB to 100NB, #150 c) Supplier not registered for NR Valves	
			Niton Valves	Mumbai		
			NSSL Ltd.	Nagpur		
			Steel Strong valves Ltd.	Navi Mumbai		


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SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
			VENUS PUMPS AND ENGG. WORKS	Kolkata	CC/CSS-GATE-BBT-upto600NB CL upto300,GATE-PSBT upto250NB CL 1500, GLV-BBT-upto300NB CL upto600, SCNRV-BBT-upto600NB CL upto150, SCNRV-BBT-upto300NB CL 300, SCNRV-PSBT-upto150NB CL upto900	
			VALTECH INDUSTRIES	Mumbai	CAST CARBON & ALLOY STEEL - VALVE/RATING/SIZE- GV/150/900, GV/300/400, GV/600/300, GV/GLV/NRV/900/250, GLV/300/300, GLV/150/350, SCNRV/150/700, SCNRV/300/350, SCNRV/600/250.	
			V K Valves Ltd.	Jalandhar		
			KBL	Kondhapuri		
7	Butterfly Valve	II	KBL	Kondhapuri		
			Fouress	Bangalore		
			Audco	Chennai		
			Weir BDK	NEW DELHI		
			Tyco	Halol		
			Inter Valve	Pune		
			Advance Valves	Noida		
			Fluidline valves	Ghaziabad		
			Instrumentation Ltd.	Palakkad		
			R and D Multiples (Metal Cast) Pvt. Ltd.	Mumbai		
			SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai	FOR CI , CCS & CSS UPTO SIZE 750 NB.	
			PENTAIR VALVES AND CONTROLS INDIA PRIVATE LIMITED	Navi Mumbai		
			UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED,	Kolkata	MOC-Cast Iron, size from 65 NB to 350 NB having rating of PN10 as per BS EN 593.	
			VENUS PUMPS AND ENGG. WORKS	Kolkata		


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CAS SUB-VENDOR LIST.xls

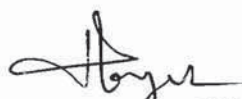
SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
8	Air Receiver	I	Integrated Engineers	Mumbai		
			Diamond Fabricators	Pune		
			Parkaire	Delhi		
			Temasme Vesselex	Noida		
			United Engineering Works	Nasik		
9	Safety Relief Valve	III	LEADER	JALANDHAR		
			SPIRAX MARSHALL	PUNE		
			FISCHER SANMAR	CHENNAI		
10	Pr./Vacuum/Dp Gauges	III	Auxitrol	U.K		
			Switzer (for DP gauge)	Chennai		
			Budenburg	U.K		
			A.N.Instruments	Kolkata		
			Bells Control	Kolkata		
			Manometer India	Mumbai		
			H Guru Industries	Kolkata		
			Ashcroft India	Kalol		
			General Inst.	Mumbai/Goa		
			Gluck India	Mumbai		
			BOSE PANDA INSTRUMENTS PVT.LTD.	Kolkata		
			Forbs Marshall	Hyderabad		
			Gauge Bourdon	Mumbai		
			H Guru Instruments	Bangalore		
			Baumer Technologies	Mumbai		
11	Pr./Vacuum/DP.switch	III	Barton Inst.system	USA		* If the total Quantity is <= 10, then inspection category III. However, manufacturer TC to be submitted
			Indfoss	Ghaziabad		
			SOR	USA		
			Dressor	USA		
			Delta control	UK		
			Trafag	Ranipet		
			GiC(Gauges Bourdon)	Parvel		
			ASHCROFT INDIA PVT LTD.	USA/GERMANY		
			Switzer	Chennai		
12	Temperature Gauge	III	Budenburg	U.K		
			A.N.Instruments	Kolkata		
			Bells Control	Kolkata		
			H Guru Industries	Kolkata		
			General Inst.	Mumbai/Goa		
			H Guru Instruments	Bangalore		
			Forbs Marshall	Hyderabad		
			Goa Instruments	Goa		
			Goa Thermostatics Instruments Pvt. Ltd.	Goa		
			Gauge Bourdon	Mumbai		
			Baumer Technologies	Mumbai		

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SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
			Ashcroft India	Kalol		
13	Transmitters (PT, TT, DPT, LT)	II	ABB	Faridabad	PRESSURE TRANSMITTER, DP TRANSMITTER and TEMP TRANSMITTER	* If the total Quantity is <= 10, then inspection category III. However, manufacturer TC to be submitted
			Yokogawa	Bangalore		
			Emerson	Mumbai		
			(ABB) -2600T series	Faridabad/Italy		
			Pune Techrol Pvt. Ltd.	Pune	Only for capacitance Type Level Transmitter	
			SIEMENS LIMITED	Mumbai		
			SMART INSTRUMENTS LTD, BRAZIL	Mumbai	LD-301 & T-301 TRANSMITTER FROM M/S SMART EQUIPMENTS BRAZIL.	
			SBEM PVT. LTD.	Pune	Only for capacitance Type Level Transmitter	
			TOSHNIWAL INDUSTRIES PVT. LTD.,	Ajmer		
			V. AUTOMAT & INSTRUMENTS (P) LTD.	NEW DELHI	a)DISPLACEMENT TYPE TRANSMITTERS. b)PRESSURE AND DP TRANSMITTERS	
			Honeywell Automation	NEW DELHI		
			Fuji	Japan		
			NIVO CONTROLS PVT. LTD.	Indore	For Capacitance type only	
			Moore Industries International Inc.	CALIFORNIA, USA	Indian Associate - Chemtrol	
			Endress + Hauser (India) Pvt. Ltd.,	NEW DELHI	TEMP TRANSMITTER ONLY	
14	HT Motor for Air compressor	I	CGL	Mandideep	Upto 1600 KW, 6.6 KV; Upto 1310 KW, 11 KV	
			Marathon Electric	Kolkata	Upto 6.6 KV, 750 KW	
			BHEL	Bhopal		
			SIEMENS	Germany		
			Hyosung	Korea		
			Hyundai	Korea		
15	Flow Switch	III	Switzer	Chennai		
			Levecon	Kolkata		
			DK Instruments	Kolkata		
			Delta	UK		
			ITT Barton	USA		
16	Temp Sensor	III	Pyro Electric	Mumbai		
			Detriv	Mumbai		
17	Flow Indicator	III	Sigma	Mumbai		
			Eureca	Pune		
18	Auto Drain Trap	III	Pennant	Pune		
			Forbes Marshall	Pune		
19	Dew point meter	III	GE Sensing	Ireland		

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SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
20	Flow Meter / Rota Meter	III	Michell Instruments	UK		
			XENTAUR	USA		
			Shaw	UK		
			Trac	Hyderabad		
			Eureca	Pune	Rota Meter only	
			Flow Star Engg.	Faridabad	Rota Meter only	
			Flow Tech instruments	Vadodara	Rota Meter only	
			Instruments Engineers Pvt. Ltd.	Hyderabad	Rota Meter only	
			Scientific Devices (Bombay) Pvt. Ltd.	Mumbai	Rota Meter only	
			Emerson Process Management	singapore	Vortex Type	
			ABB Ltd.	India	Vortex Type	
			Krohne Marshall Pvt. Ltd.	India	Vortex Type	
			Endress + Hauser (I) Pvt. Ltd.	India	Vortex Type	
			Yokogawa Electric Corporation (other than high temp & h2 services)	japan	Vortex Type	
			Krohne Messtechnik GmbH & Co. Kg	Germany	Vortex Type	
21	Level Indicator/ Gauge	III	Flow Star	Faridabad		
			Scientific Devices	Mumbai		
			Gauges Bourden	Parvel		
			SBEM	Pune		
			Pune Techtrol	Pune		
			Levcon	Kolkata		
			Sigma	Mumbai		
			V-Automat	New Delhi		
22	Solenoid Valve	III	DK Instruments	Kolkata		
			HERION	GERMANY/ ITALY		
			ROTEX AUTOMATION LTD.	V V NAGAR/ BARODA		
			ASCO	CHENNAI		
			JEFFERSON	ARGENTINA		
23	Cable trays (max 300 meters)	III	AVCON	MUMBAI		
			INAR PROFILE	ANNAKAPALLI		
			ANAND UDYOG	THANE		
			MJ ENGG.	DELHI		
			INDIANA	MUMBAI		Galvanizing. At Karmatara
			TECHNO ENGG	CHANDIGARH		
			JAMUNA METAL	DELHI		


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SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
			INDUSTRIAL PERFORATION	KOLKATA		Galvanizing at Unistar
			VATCO	MUMBAI		Galvanizing At Sigma Mumbai
24	Cable Glands	III	SUNIL & COMPANY	KOLKATA		
			ARUP ENGG	KOLKATA		
			COMMET	MUMBAI		
			QUALITY PRECISION	KOLKATA		
25	Cable Lugs	III	DOWELLS	MUMBAI		
			CHETNA ENGG	NASIK		
			3D	VALSAD		
26	DC LEAD ACID/NI-CD BATTERY	III	AMCO SAFT INDIA LTD	BANGALORE	Ni-Cd batteries only	
			EXIDE INDUSTRIES LTD	NEW DELHI	Lead Acid batteries only.	
			HBL POWER SYSTEMS LTD	Hyderabad	Ni/Cd and TUBULAR TYPE for Lead acid	
			HOPPECKE BATTERIEN GMBH & CO.KG,	Germany		
27	DC Battery Charger (for PLC Panel)	III	AMARA RAJA POWER SYSTEMS LIMITED	Tirupati		
			CHHABI ELECTRICALS PVT.LTD.	Jaigaon		
			CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED	Kolkata		
			DUBAS ENGG PVT LTD	BANGALORE		
			HBL POWER SYSTEMS	Hyderabad		
			JEMA ENERGY	Spain	For Static SCR Type Full Wave fully Control type	
			MASS-TECH CONTROLS PVT.LTD.	Mumbai		
			STATCON POWER CONTROLS LTD	Noida		
28	INSTRUMENT FITTINGS	III	AURA INCORPORATED	NEW DELHI		
			Astec Valves & Fittings Pvt. Ltd.,	Mumbai		
			Arya Crafts & Engineering Pvt. Ltd.	Mumbai		
			Comfit & Valve Pvt. Ltd.	Nandasan-Gujarat		
			FLUIDFIT ENGINEERS PVT. LTD.	Mumbai		
			Fluid Controls Pvt. Ltd.	Mumbai		
			HP VALVES & FITTINGS INDIA PVT. LTD.	Chennai		
			PRECISION ENGINEERING INDUSTRIES	Mumbai		
			Panam Engineers,	Mumbai		
			Perfect Instrumentation Control (India) Pvt. Ltd.	Mumbai		
			VIKAS INDUSTRIAL PRODUCTS	Noida		
29	SS Pipes	III	REMI	Mumbai		
			Ratmani	Ahmedabad		
			Apex Tubes	Behror		
			Choksi	Ahmedabad		
30	UPS	III	HITACHI-HIREL	Gandhinagar		
			APC	Bangalore		
			Delta	Gurgaon		
			Emerson	Mumbai		
			DB Power	Pune		
			Aplab	Mumbai		

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27/11/15
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CAS SUB-VENDOR LIST.xls

SL No	Item	QP / Insp.Cat	Proposed Subvendor	Place of Manufacturer	Technical Limit	Remarks
31	OWS/PC	III	HP/Compaq /Dell/HCL/IBM/Lenovo			
32	Printer	III	HP/Cannon/Epson/Xerox/IBM /Lexmark			
33	PLC Based Panels	I	SIEMENS	Nasik		
			SCHNEIDER	Nasik		
			ROCKWELL	Sahibabad		
			GE Intelligent Platform	BANGALORE		
			Honeywell Automation India Limited ,	Pune		
			ABB	Bangalore		
34	Fibre Optic Cable	III	Birla Ericsson	Rewa		
			Finolex	Pune/Goa		
			Aksh Fibre	Bhiwadi		
35	Junction Box	III	AJMERA INDUSTRIAL & FLEXPRO ELECTRICALS	Mumbai	For galvanised & FRP Junction	
			K.S.INSTRUMENTS	Navsari, Gujarat	Metal type Junction boxes only	
			SUCHITRA INDUSTRIES	Bangalore		
			Shrenik & Company,	Bangalore		
				Ahemdabad		
36	PAINTS	III	Asian Paints (I) Ltd.	Mumbai		
			Berger Paints India Ltd	Delhi		
			Goodlass Nerolac	Mumbai		
			Jenson & Nicholson (I) Ltd	Gurgaon		
			CDC carboline (I) Ltd.	Delhi		
			Shalimar Paints Ltd.	Gurgaon		
			Addison Paints Ltd	Chennai		
			Grand Polycoat	Mumbai		
			Bombay Paints	Mumbai		
			Jotun Paints	Pune		
			Hemple Paints	Singapore		

NOTES:

1) INSP CAT I : FOR THOSE ITEMS THE QUALITY PLANS ARE APPROVED BY CUSTOMER AND FINAL ACCEPTANCE WILL BE ON PHYSICAL INSPECTION WITNESS BY BHEL & CUSTOMER.

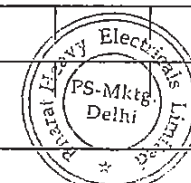
2) INSP CAT II : FOR THOSE ITEMS THE QUALITY PLANS ARE APPROVED BY CUSTOMER. HOWEVER NO PHYSICAL INSPECTION WILL BE DONE BY BHEL / CUSTOMER. THE FINAL ACCEPTANCE BY BHEL / CUSTOMER SHALL BE ON THE BASIS OF REVIEW OF DOCUMENTS AS PER QP.

3) INSP CAT III : FOR THOSE ITEMS FINAL ACCEPTANCE BY BHEL / CUSTOMER BASED ON BIDDER'S COC.

4) THE ABOVE SUB VENDOR LIST IS INDICATIVE ONLY AND IS SUBJECT TO APPROVAL/ACCEPTANCE BY CUSTOMER/BHEL . BIDDER TO PROPOSE HIS SUB VENDOR LIST WITH BACK UP DOCUMENTS (EXPERIENCE LIST, END USER CERTIFICATE AS APPLICABLE) WHICH WILL SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY TECHNICAL , COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/CUSTOMER.

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 7/7/15
 (Harish Kumar)

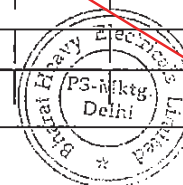
SR NO	ITEM	QP /INS- PN CAT *	QP NO.	QP SUB- MISSION SCHEDU LE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
13	SCREENED CABLES	1				DELTON	FARIDABA D	A			
		1				THERMO CABLES	HYDERABA D	A			
		1				CORDS	BHIWADI /KAHARANI	A			
		1				POLYCAB	DAMAN	A			
		1				INCAB	PUNE	A			
		1				ELKAY TELELINKS	FARIDABA D	A			
		1				KEI	BHIWADI	A			
		1				CMI	FARIDABA D	DR			
		1				RELIANCE ENGRS LTD	BANGALOR E	DR*			
14	AUXILIARY CONTROL PANEL					REFER SEPARATE LIST					
15	LT MOTORS (Refer Note 1)	1				KEC	BANGALOR E/HUBLI	A			(HUBLI UPTO 90 KW ,RQP)For Flame Proof also
		1				NGEF	HUBLI	A			UP TO 15 KW ONLY.
		1				CGL	AHMEDNA GAR	A			RQP,For Flame Proof also
		1				MARATHON ELEC. INDIA LTD	KOLKATA	A			RQP,For Flame Proof also
		1				JYOTI	VADODARA	A			
		1				BBL	MUMBAI	A			RQP,upto 160 KW only,For Flame Proof also
		1				LAXMI HYDRAULIC PVT. LTD	SHOLAPUR	A			upto 120 KW
		1				ABB	FARIDABA D/BANGAL ORE	A			RQP. Faridabad upto 55 KW Bangalore above 55



Signature

ENGINEERING DIV / QAI

SR NO	ITEM	QP /INS- PN CAT *	QP NO.	QP SUB- MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
15	LT MOTORS (Refer Note 1)	I				SIEMENS	MUMBAI	A			RQP
16	ELECTRICAL ACTUATOR(WITH GEAR BOX ALSO)	II	QVI-Q-078			HAROLD BECK	GERMANY	A			
		II				DREHMO	GERMANY	A			
		II				AUMA	GERMANY	A			
		II				ROTORK	CHENNAI/B ANGALORE	A			
		II				ROTORK	UK	A			
		II				NIPPON GEAR	JAPAN	A			
		II				LIMITORQUE	USA	A			
		II				LIMITORQUE	FARIDABA D	A			
		II				AUMA INDIA	BANGLORE	A			
17	CABLE TRAY & ACCESSORIES					REFER SEPARATE LIST					
18	FLEXIBLE CABLE TRAY SUPPORT					REFER SEPARATE LIST					
19	CABLE GLANDS					REFER SEPARATE LIST					
20	CABLE LUGS					REFER SEPARATE LIST					
21	GEARED MOTOR	III				KIRLOSKAR ELEC LTD	HUBLI/BAN GALORE	A			
		III				NEW ALLENBERRY WORKS	KOLKATTA	A			
		III				SHANTI GEARS LTD	COIMBATO RE	A			
		III				POWER BUILD	VV NAGAR	A			
		III				LAXMI HYDRAULIC PVT. LTD	SHOLAPUR	A			

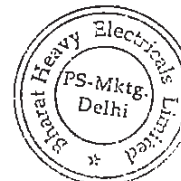


SR NO	ITEM	QP /INS- PN CAT	QP NO.	QP SUB- MISSION SCHEDULE	QP APPL SCHED ULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATUS / CAT	SS DETAIL SUB- SCHED ULE	SC APPL SCHED ULE	REMARKS
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APPENDIX. B
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.Note1 : a) Acceptance of Motor less than 30 KW is based on COC of the manufacturer and the contractor confirming as follows: It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp. voltage and frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud and gland plate and tested in accordance with approved drawing /data sheets b) 30 KW and above Acceptance of Motor rating between 30 KW 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 witnessed by main contractor along with COC of the manufacturer and the contractor confirming as follows: It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage and frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud and gland plate, space heater and tested in accordance with approved drawing /data sheets. Above 50 KW up to 200 KW NTPC inspection as per approved QP Note 2: Misc Items like name plate, wire marker, clamps and pads for thermocouple adaptor, union, cross, socket and plug, pneumatic fittings tubes shall be as per BHEL system

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ANNEXURE-I

	PROJECT: NORTH KARANPURA STPP (3X660 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: EPC PACKAGE						REV. NO.	0
	MAIN SUPPLIER: BHEL		SUB SYSTEM: CIVIL WORKS				DATE	16.12.2013
	CONTRACT NO.: CS-4410-001-2							
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS	
	PREPAINTED COIL COATED STEEL SYSTEM			INTERARCH	NOIDA	N		
				LLOYD INSULATION	-	N		
				MG INDUSTRIES	FARIDABAD	N		
				ARM STRONG	NEW DELHI	N		
9.	PAINT AND PAINTING SYSTEM	III	-	BERGER	-	N		
				SHALIMAR PAINTS	-	N		
				JENSON AND NICHOLSON	-	N		
				KANSAI NEROLAC	-	N		
				AKZO NOBEL	-	N		
				ASIAN PAINTS	-	N		
10.	COLOUR COATED SHEET (FOR COIL)	I	-	UNION STEEL	KOREA	A		
				DONGBU STEEL	KOREA	A		
				BHUSHAN STEEL AND STRIPS LTD.	RAIGAD	A		
				ESSAR STEEL LTD	PUNE	A		
				NATIONAL STEEL AND AGRO	DHAR	A		
				JSW STEEL COATED PRODUCTS LTD	KAMLESHWAR	A	Formerly JSW ISPAT Steel Ltd	
				BHUSHAN STEEL LTD.	SAHIBABAD	A		
				JSW LTD	THANE	A		
				TATA BLUESCOPE STEEL LTD	JAMSHEDPUR	A	*AL-ZN COIL FOR CLADDING	
	PROFILERS FOR DECKING SHEETS	I		UNIMET PROFILES LIMITED	DHARUHERA	A		
				MULTICOLOUR STEEL INDIA LIMITED	GURGAON	A		
				ISOLLOYD	SOLAN	A		
				NATIONAL STEEL AND	DHAR	A		

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APPENDIX B
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PACKAGE WISE REGISTERED SUPPLIER LIST (PERMANENT CATEGORY) AS ON 12/26/2019 5:05:46 PM

SI No	Package Name	Supplier Name	Supplier Communication Address
1	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Kaustubha Udyog,	S.No. 36/1/1, Sinhgad Road, Vadgaon Khurd, Near Lokmat Press, Pune, Phone- 020-24393577, Pincode : Email : pressure@vsnl.com .
2	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
3	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SWITZER PROCESS INSTRUMENTS PVT. LTD.	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in
4	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	GENERAL INSTRUMENTS CONSORTIUM	Mr. Amarendra Kulkarni 194/195, Gopi Tank Road, Off. Pandurang Naik Marg, Mahim Mumbai Phone- 9323195251 Pincode : 400016 Email : amarendra@general-gauges.com
5	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	Barksdale GmbH, Germany	Michael Weileder Dorn Assenheimer, Strasse 27 Reichelsheim Phone- +91-9999107840 Pincode : D-61203 Email : msingh@barksdale.de
6	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	DRESSER INDUSTRIES INC.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincode : 382729 Email : Nishit.patel@ashcroftindia.com
7	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com , avdhesh@sherman-india.com .
8	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS INDUSTRIES LIMITED	B-20-21, INDUSTRIAL AREA, MEERUT ROAD, GHAZIABAD Phone- 0120-2712016 Pincode : Email : mktg@indfos.com
9	PRESSURE SWITCH/DIFF. PRESSURE SWITCH	INDFOS (INDIA) LIMITED	MR.L.C.VENKATRANGAN/MR.B.KANNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincode : 600017 Email : delhi@indfos.com
10	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	BOSE PANDA INSTRUMENTS PVT.LTD.	Mr. Partha Bose 44, Saheed Hemanta Kumar Bose, Sarani, Kolkata Phone- +91 33 2548 7220 Pincode : 700074 Email : parthabosebp@gmail.com ; bosepanda@vsnl.net
11	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in

12	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHIMINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mauru@vsnl.net
13	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com
14	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
15	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.-MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com
16	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@haurusouth.com
17	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com .
18	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in
19	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com
20	TEMPERATURE GAUGE	H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	32,INDUSTRIAL SUBURB YESWANTHAPUR BANGALORE Phone- 080-23370300, Pincode : 560022 Email : info@haurusouth.com
21	TEMPERATURE GAUGE	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com .
22	TEMPERATURE GAUGE	H.GURU INDUSTRIES	Mr. G. D. Hazra/Mr. P. K. Mitra 10 B, HO-CHIMINH SARANI, KOLKATA Phone- 033 2282 2463 / 1637 Pincode : 700071 Email : mauru@vsnl.net
23	TEMPERATURE GAUGE	GOA THERMOSTATIC INSTRUMENTS PVT.LTD.	FLAT -B , GF, HILL CROWN APTS., COLLEGE ROAD, MAPUSA Phone- Pincode : 403525 Email : atilworks@pvro-electric.in
24	TEMPERATURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	MARKETING DIVISION, 5th FLOOR, 59-B, CHOWRINGHEE ROAD, KOLKATA Phone- 24757784,22472509 Pincode : 700020 Email : anidel@bol.net.in
25	TEMPERATURE GAUGE	FORBES MARSHALL (HYD) LTD.	MR SAILESH PATALAY/MR. M K SRINIVASAN PLOT NO.A-19/2, & T-4/2, IDA, NACHARAM, HYDERABAD Phone- 9849913704 Pincode : 500 076 Email : mksrinivasan@forbesmarshall.com

26	TEMPERATURE GAUGE	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.com,
27	TEMPERATURE GAUGE	PRECISION MASS PRODUCTS PVT. LTD.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 9999464663 Pincode : 382729 Email : sales@precisionmass.com
28	TEMPERATURE GAUGE	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.- MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com
29	FLOW ELEMENT	TM TECNOMATIC SPA	MR. ANTONIO NOVIELLO/Mrs. Enrica Bazzocc VIA DELLE INDUSTRIE, 36 CREMONA Phone- 39037221574 Pincode : 26100 Email : info@tmtecnomatic.com
30	FLOW ELEMENT	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net
31	FLOW ELEMENT	INSTRUMENTATION LTD.	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com:fa2@ilpot.com
32	FLOW ELEMENT	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com
33	TEMP. ELEMENT	DETRIVE INSTRUMENTATION & ELECTRONICS LTD.	320, TV INDUSTIAL ESTATE, OFF.DR.A.BESANT ROAD, BEHIND GLAXO, WORLI, MUMBAI Phone- 24934125,24938403 Pincode : 400025 Email : trivtech@vsnl.com
34	TEMP. ELEMENT	Nesstech Instruments Private Limited	26/2, G Type, Global Industrial Park Near Nahuli Railway Crossing, Valvada Vapi Phone- 9920576002 Pincode : 396105 Email : sales@nesstech.co.in
35	TEMP. ELEMENT	Thermal Instrument India Pvt. Ltd.	Mr. Raghavendra M. Kulkarni 194/195, Gopi Tank Road Behind Citylight Cinema,Mahim Mumbai Phone- 09322664709 Pincode : 400016 Email : ramk@qiconindia.com
36	TEMP. ELEMENT	Tempsens Instrument (I) Pvt Ltd	MR. V.P.RATHI/MR. HEMANT RATHI B-188A ROAD NO.5 , M.I.A UDAIPUR Phone- 09352420069 Pincode : 313003 Email : info@tempsens.com
37	TEMP. ELEMENT	Baumer Technologies India Pvt. Ltd.	Mr. Shyam Warilani/Mr. V Suresh Babu 36, DAMJI SHAMJI INDUSTRIAL COMPLEX, OFF.- MAHAKALI CAVES ROAD, ANDHERI(E) MUMBAI Phone- +91 99589 25151 Pincode : 400093 Email : sales.in@baumer.com
38	TEMP. ELEMENT	GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	D2/5, Mapusa Industrial Estate, Mapusa, Goa, Phone- 09326054551, Pincode : 403507, Email : sumukh@goainstruments.com,

39	TEMP. ELEMENT	PYRO ELECTRIC INSTRUMENTS GOA PVT.LTD.	M. D. BICHU/R. M. BICHU G.B, HILL CROWN APARTMENTS, COLLEGE ROAD, MAPUSA Phone- 9326114601 Pincode : 403507 Email : priranka.marketing@pyro-electric.in
40	TEMP. ELEMENT	GAUGE BOURDON INDIA PVT. LTD.	194/195, Gopi Tank Road, Off Pandurang Naik Marg, Mahim Mumbai, Phone- 011-41607463, Pincode : 400016, Email : gicdelhi@general-gauges.com .
41	TEMP. ELEMENT	TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com .
42	TEMP. ELEMENT	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbnl@vsnl.com
43	TRANSMITTERS	YOKOGAWA INDIA LIMITED,	PLOT NO.96, ELECTRONICS CITY COMPLEX, HOSUR ROAD, BANGALORE, Phone- 080-41586000, Pincode : Email : uday.shankar@in.yokogawa.com .
44	TRANSMITTERS	ABB INDIA LIMITED	MR. RAJIV GOVIL 14, MATHURA ROAD, FARIDABAD Phone- 09971085678 Pincode : 121003 Email : vipin.swami@in.abb.com
45	TRANSMITTERS	V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincode : 110 020 Email : sales@vautomat.com
46	TRANSMITTERS	Pune Techtrol Pvt. Ltd.	N.P.Khatan/Sudhakar Badiger S-18, MIDC Bhosari, Pune Phone- 9850560042 Pincode : 411 026 Email : ho@punetechtrol.com
47	TRANSMITTERS	TOSHNIWAL INDUSTRIES PVT. LTD.,	Industrial Estate, Makhupura, Ajmer, Phone- 9352009000, Pincode : 305002, Email : info@tipl.com .
48	TRANSMITTERS	Endress + Hauser (India) Pvt. Ltd.,	Mr. Prakash Vaghela 215-216, DLF Tower 'A', Jasola District Centre, New Delhi, Phone- 9717593001, Pincode : 110025, Email : prakash.vaghela@in.endress.com .
49	TRANSMITTERS	SBEM PVT. LTD.	MR.N.K. BEDARKAR/MR. VISHWANATH KARANDIK 39, ELECTRONIC CO.OP. ESTATE, PUNE SATARA ROAD PUNE, Phone- 912041030100 Pincode : 411009 Email : newdelhi@sbem.co.in
50	TRANSMITTERS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com .
51	TRANSMITTERS	SMART INSTRUMENTS LTD, BRAZIL	Agents: Digital Electronic Ltd. 74/11 'C' Cross Road MIDC Andheri (East) MUMBAI Phone- 28208477 Pincode : 400093 Email : corp@delhby.rngms.ems.vsnl.net.in
52	TRANSMITTERS	SIEMENS LIMITED	Dr. Armin Bruck/Sandeep Mathur 130, Pandurang Budhkar Marg Worli Mumbai Phone- 0124 383 7377 Pincode : 400018 Email : ankit.varshney@siemens.com

53	TRANSMITTERS	Moore Industries International Inc.	Leonard.W. Moore/ Matt Moren 16650 Schoenborn St. North Hills Phone- +1 818 830 5548 Pincod : 91343 Email : mmoren@miinet.com
54	TRANSMITTERS	EMERSON PROCESS MANAGEMENT (INDIA) PVT.LTD.	Mr. Amit Paithankar/Vikram Raj Singh 206-210,BALARAMA BUILDING 2ND FLR. BANDRA EAST MUMBAI Phone- 9619121500 Pincod : 400051 Email : vikramraj.singh@emerson.com
55	TRANSMITTERS	Honeywell Automation India Limited	Mr. Ritwij Kulkarni 917, INTERNATIONAL TRADE TOWER, NEHRU PLACE, NEW DELHI Phone- 9890200584 Pincod : 110019 Email : raiesh.chaudharv@honevwell.com
56	TRANSMITTERS	NIVO CONTROLS PVT. LTD.	Mr. Praveen Toshniwal 104-115, Electronic Complex, Indore Phone- 0731-4081305 Pincod : 452010 Email : sales@nivocontrols.com
57	TEMPERATURE SWITCH	SOR INC.	LARRY DEGARMO/Avdhesh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincod : 66215 Email : Ldegarmo@sorinc.com, avdhesh@sherman-india.com
58	TEMPERATURE SWITCH	TOSHNIWAL BROTHERS PVT.LTD.	WORKS:TOSHNIWAL IND.PVT.LTD, INDUSTRIAL ESTATE MAKHUPURA, AJMER Phone- 441171 Pincod : 305002 Email : toshniwalprocess@gmail.com
59	TEMPERATURE SWITCH	DRESSER INDUSTRIES INC.	Mr. Nishit Patel/Mr. Anuj Verma Plot No.2306, Phase II, GIDC Chhatral Kalol Phone- 02764-233682 Pincod : 382729 Email : Nishit.patel@ashcroftindia.com
60	TEMPERATURE SWITCH	INDFOS (INDIA) LIMITED	MR.L.C.VENKATRANGAN/MR.B.KANNAN New No.17, II Floor, Adwave Towers, Dr.Sevalia Shivaji Salai, T.Nagar Chennai Phone- +91 44 24353407 Pincod : 600017 Email : delhi@indfos.com
61	TEMPERATURE SWITCH	SWITZER PROCESS INSTRUMENTS PVT. LTD.	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincod : 600050 Email : sales@switzerprocess.co.in
62	SIGHT FLOW INDICATORS	V. AUTOMAT & INSTRUMENTS (P) LTD.	Mr. R. K. BASSI/Mr. PRAVEEN KUMAR F-61, OKHLA INDL.AREA, PH-1 NEW DELHI Phone- 9810005826 Pincod : 110 020 Email : sales@vautomat.com
63	SIGHT FLOW INDICATORS	BLISS ANAND PVT. LTD.	Mr. Vikas Anand/ Mr.RGRajan 92B & 93 B , IMT MANESAR Gurgaon Phone- 0124-4366000 TO 9 Pincod : 122001 Email : sales@blissanand.com
64	SIGHT FLOW INDICATORS	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincod : 400 701, Email : sdbpl@vsnl.com
65	SIGHT FLOW INDICATORS	B.K.EQUIPMENTS PVT.LTD.	T. BALAKRISHNAN/S.VENKATESH 217 , ARCOT ROAD PORUR , CHENNAI Phone- 9444057761 Pincod : 600116 Email : bkequip@gmail.com

66	SIGHT FLOW INDICATORS	SIGMA INSTRUMENTS CO.	Gopal Kannan/R Gopinath 201, ANANDRAJ INDUSTRIAL ESTATE, OFF.LBS MARG, SONAPUR LANE, BHANDUP (W) MUMBAI Phone- +919821038162 Pincode : 400078 Email : sales@sigmainstruments.co.in
67	SIGHT FLOW INDICATORS	INSTRUMENTATION ENGINEERS PVT LTD	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com
68	DIFFERENTIAL PRESSURE SWITCH	SOR INC.	LARRY DEGARMO/Avdresh Chandra, 14685 W. 105TH STREET LENEXA Phone- 09810905139, Pincode : 66215 Email : Ldegarmo@sorinc.com , avdresh@sherman-india.com
69	ANUBAR (DELTA TUBE)	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net
70	ANUBAR (DELTA TUBE)	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com
71	ANUBAR (DELTA TUBE)	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola,Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com
72	ANUBAR (DELTA TUBE)	SWITZER PROCESS INSTRUMENTS PVT. LTD.	Mr. V S Jayaprakash, 128, SIDCO North Phase, Ambattur Estates CHENNAI Phone- 044-26252017/2018 Pincode : 600050 Email : sales@switzerprocess.co.in
73	ANUBAR (DELTA TUBE)	MINCO (INDIA) PRIVATE LIMITED	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com
74	JUNCTION BOX	K.S.INSTRUMENTS PVT.LTD.	S Raghavan No. 72, 3rd Main, 1st Stage Industrial Suburb, Yeshwanthpur Bangalore Phone- 9880385770 Pincode : 560022 Email : sales1@ksinstruments.net
75	JUNCTION BOX	SUCHITRA INDUSTRIES	NO-2,OPP-27 AECS LAYOUT 2ND STG REJAMAHALVILAS EXTN 2ND STG BANGALORE Phone- Pincode : Email : suchitra.industriesblr@gmail.com
76	JUNCTION BOX	Shrenik & Company,	Mr. Mitesh Shah/Mr. Pulin Shah 39 A/3 ,Panchratna Industrial Estate, Sarkhej-Bavla Road Ahmedabad Phone- 9825024921 Pincode : 382213 Email : sales@pustron.com , pulin@sumin.com
77	JUNCTION BOX	FLEXPRO ELECTRICALS PVT. LTD.	Mr. Dineshbhai Zaveri C-1/ 27&37, GIDC, Kabilpore, Navsari Phone- 02637-265140,265003 Pincode : 396424 Email : flexpro@flexproltd.com

78	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	JIGNESH MAHENDRA AJMERA DENA BANK BLDG.,SHREE NAGESH INDL. ESTATE,STATION ROAD, MUMBAI Phone- 022 67973578 Pincode : 400 088 Email : ajmerna@ajmerna.net , imaimera@yahoo.com
79	Cold Junction Compensation Box (CJCB)	CREATIVE INSTRUMENTS & CONTROLS	NO-17/1 , 1ST FLOOR , 11TH CROSS 1ST K BLOCK , RAJAJINAGAR, BANGALORE-560010 Phone- Pincode : Email : crinstruments@gmail.com
80	INSTRUMENTS TUBE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
81	INSTRUMENTS TUBE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : nirai@aurainc.com
82	INSTRUMENTS TUBE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : neiks@vsnl.com
83	INSTRUMENTS TUBE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
84	ROTAMETER	INSTRUMENTATION ENGINEERS PVT LTD	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com
85	ROTAMETER	Flow Star Engineering Pvt. Ltd.,	MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Industrial 20/3, Mathura Road FARIDABAD Phone- 9818176380 Pincode : 121005 Email : khalid@flowstar.co.in
86	ROTAMETER	TANSA EQUIPMENTS PVT. LTD.	Mr. Vardhan Tamhankar, Unit No35/36/41,Om Anand Industrial Est. Mohanjee Sundarjee Road,Raghunath Nagar, Thane Phone- 022- 25832323 Pincode : 400604 Email : tansaindia@gmail.com
87	ROTAMETER	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	Mr V. K. Pandit/Mr Ashish Shaha 17-20, Royal chambers, Paud Road Pune Phone- 9370469466 Pincode : 411038 Email : sales@eurekaflow.com
88	ROTAMETER	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbnl@vsnl.com
89	INSTRUMENTS PIPE FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com

90	INSTRUMENTS PIPE FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com
91	INSTRUMENTS PIPE FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : neiks@vsnl.com
92	INSTRUMENTS PIPE FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : nirai@aurainc.com
93	ULTRASONIC FLOW METERS	Electronet Equipments Pvt Ltd.	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com
94	ULTRASONIC FLOW METERS	Adept Fluidyne Pvt. Ltd.	Vinayak Gadre Plot No 4,S.No.17/1-B Kothrud Industrial Estate Pune Phone- 020 25464551 Pincode : 411038 Email : info@adentfluidvne.com
95	ULTRASONIC FLOW METERS	FLEXIM Flexible Industriemesstechnik GmbH	Boxberger Str., 4, Berlin Berlin Phone- 0049 30 93 66 76 60 Pincode : 12681 Email : info@flexim.de
96	ULTRASONIC FLOW METERS	Rockwin Flowmeter India Pvt. Ltd.	B-24, Site-IV, Sahibabad Industrial Area Ghaziabad, Phone- 9810129687 Pincode : 201010. Email : amiya@rockwin.com
97	ULTRASONIC FLOW METERS	FLASH FORGE PVT LTD	Mr. Gautam Makker, 503, 'A'-wing, Delphi, Orchard Avenue Road, Powai Mumbai Phone- 022-42784300 Pincode : 400076 Email : hemendrapatil@f-f.co.in
98	ULTRASONIC FLOW METERS	NIVUS GMBH	Mr. Marcus Fischer Im Taele 2, D - 75031 Eppingen Phone- 00491712233770 Pincode : Email : carolin.schuster@nivus.com
99	FLOW ELEMENT - ORIFICE	MINCO (INDIA) PRIVATE LIMITED	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com
100	FLOW ELEMENT - ORIFICE	TANSA EQUIPMENTS PVT. LTD.	Mr. Vardhan Tamhankar, Unit No35/36/41,Om Anand Industrial Est. Mohanjee Sundarjee Road,Raghunath Nagar, Thane Phone- 022- 25832323 Pincode : 400604 Email : tansaindia@gmail.com
101	FLOW ELEMENT - ORIFICE	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com
102	FLOW ELEMENT - ORIFICE	Electronet Equipments Pvt Ltd.	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com

103	FLOW ELEMENT - ORIFICE	INSTRUMENTATION LTD.	KANJIKODE WEST, PALALKKAD, PALAKKAD Phone- 2566127-130,2567128 Pincode : 678623 Email : icvldil@gmail.com ; fa2@ilbqt.com
104	FLOW ELEMENT - ORIFICE	HYDROPNEUMATICS PVT. LTD.	Mr. DM Bichu G/B, Hill Crown Apts., College Road Mapusa Phone- 0832-2360364 Pincode : 403507 Email : ajayrc@hydropneumatics.co.in
105	FLOW ELEMENT - ORIFICE	Flow Star Engineering Pvt. Ltd.,	MR. KHALID AKHTAR/MR. TAPAN KUMAR JANA Plot No-7 F/2, Northern India Industrial 20/3, Mathura Road FARIDABAD Phone- 9818176380 Pincode : 121005 Email : khalid@flowstar.co.in
106	FLOW ELEMENT - ORIFICE	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola, Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com
107	FLOW ELEMENT - ORIFICE	MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	Mr. Raghavendra M. Kulkarni D2-49/50, Tivim Industrial Estate, Karaswada Mapusa Phone- 0832-2257059 Pincode : 403526 Email : qicflowelement@qiconindia.com
108	FLOW ELEMENT - ORIFICE	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net
109	FLOW ELEMENT - ORIFICE	CHEMTROLS INDUSTRIES PVT. LTD.	Mr. K. NANDAKUMAR AMAR HILL, SAKI VIHAR ROAD, POWAI, MUMBAI Phone- 022- 67151261 Pincode : 400072 Email : manikandan@chemtrols.com
110	FLOW ELEMENT - ORIFICE	INSTRUMENTATION ENGINEERS PVT LTD	SH.N.V.RAM GOPAL/MS. N.NIHARIKA PLOTS 1,2,3, PHASE-III, IDA, JEEDIMETLA HYDERABAD Phone- 9848407365 Pincode : 500055 Email : iedelhi@ieflowmeters.com
111	FLOW ELEMENT - ORIFICE	DYNAFLUID VALVES AND FLOW CONTROLS (P) LTD.	Mr. Yogish M. Kulkarni Plot # 23, Udyambag, Belgaum Phone- 0831-4210386 Pincode : 590008 Email : yogish@dyna-fluid.com
112	FLOW ELEMENT - NOZZLE	MICRO PRECISION PRODUCTS PVT. LTD.	Mr. Anil Bhati, H.B. No.-40, Revenue Estate, Village-Dudhola, Tehsil & Distt. Palwal FARIDABAD Phone- 9560742713;095607427 Pincode : 121002 Email : anil.bhati@wika.com
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116	FLOW ELEMENT - NOZZLE	STAR-MECH CONTROLS (I) PVT.LTD.	SUSHILLOTAM, SUSHILLOTAM, 29/3A/3, SASANE NAGAR, HADAPSAR, PUNE Phone- 02026970450 Pincode : 411028 Email : marketing@starmech.net
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118	FLOW ELEMENT - NOZZLE	MINCO (INDIA) PRIVATE LIMITED	Mr. Rajeev Vasudeva, D/35, TIVIM INDUSTRIAL ESTATE, KARASWADA, MAPUSA, Goa, Phone- 9313637073 Pincode : 403526, Email : gicdelhi@general-gauges.com
119	INSTRUMENT FITTINGS	AURA INCORPORATED	NIRAJ SHARAN/SUJIT KUMAR W-167A, GREATER KAILASH-II NEW DELHI Phone- 9810182430 Pincode : 110048 Email : nirai@aurainc.com
120	INSTRUMENT FITTINGS	PRECISION ENGINEERING INDUSTRIES	K. SITARAM/ K. SRINIVAS 7,SIDHAPURA INDUSTRIAL ESTATE S.V. ROAD,GOREGAON(W) MUMBAI Phone- 022 42631700 Pincode : 400 062 Email : neiks@vsnl.com
121	INSTRUMENT FITTINGS	Comfit & Valve Pvt. Ltd.	Mr. Jeetu Jain/Mr. Vinay Sosa Survey No. 23/1, Part 2, Ahmedabad-Mehsana Highway Laxmipura, Nandasan Phone- 02764-267036/37 Pincode : 382705 Email : marketing@com-fit.com
122	INSTRUMENT FITTINGS	HP VALVES & FITTINGS INDIA PVT. LTD.	S. Harichandran/P.S. Pandi B-11, Mugappair Industrial Estate, CHENNAI Phone- 044 26252537 Pincode : 600037 Email : sales@hpvalvesindia.com
123	INSTRUMENT FITTINGS	Arya Crafts & Engineering Pvt. Ltd.	Mr.Sanjay Brahman/Mr.Shyam Vazirani 102, Vora Industrial Estate No.4 Navghar, Vasai Road (E) Dist.Thane, Mumbai Phone- +91-250-2392246 Pincode : 401210 Email : arya@arvaengg.com
124	INSTRUMENT FITTINGS	Perfect Instrumentation Control (India) Pvt. Ltd.	MD Hussain Shaikh/Shahanawaz Khan Gala No. 168, Loheki Chwal,216/ 218, Maulana Azad Rd. Nagpada Junction Mumbai Phone- 91-9324383121 Pincode : 400008 Email : shahanawaz.khan@perfectinstrumentation.com
125	INSTRUMENT FITTINGS	FLUIDFIT ENGINEERS PVT. LTD.	Mr. Abbas Bhola Potia Building No. 2, Office No. 3,292, Bellasis Road,Mumbai Central (East) Mumbai Phone- 9920044113 Pincode : 400008 Email : ab@fluidfitengg.com
126	INSTRUMENT FITTINGS	VIKAS INDUSTRIAL PRODUCTS	S.R.SINGH/NAVEEN SINGH B - 2, SECTOR - 6, NOIDA Phone- +91-9810122070 Pincode : 201301 Email : naveensingh@vsnl.com
127	INSTRUMENT FITTINGS	Fluid Controls Pvt. Ltd.	Sophie Y. Moochhala/Mayur Rajput J.V.PATEL, I.T.I CMPD, B.MADHUKAR MARG, ELPHINSTONE ROADSTN.(WR), MUMBAI Phone- (022) 43338000 Pincode : 400013 Email : sales@fluidcontrols.com

128	INSTRUMENT FITTINGS	PANAM ENGINEERS	Mr. Santosh Shukla 203, Jaisingh Business,Parsiwada, Sahar road,Andheri(East), Mumbai, Phone- 9892179529, Pincode : 400099, Email : santosh@panamengineers.com .
129	ELECTROMAGNETIC FLOW METER	V.A Valves	Mr.Vishal Jain, Udyog Nagar, Gadaipur, Jalandhar Phone- 9872626376 Pincode : 144004 Email : support@fedrelflowmeters.com
130	ELECTROMAGNETIC FLOW METER	Adept Fluidyne Pvt. Ltd.	Vinayak Gadre Plot No 4,S.No.17/1-B Kothrud Industrial Estate Pune Phone- 020 25464551 Pincode : 411038 Email : info@adentfluidvne.com
131	ELECTROMAGNETIC FLOW METER	Electronet Equipments Pvt Ltd.	Mr. Rajendra Nagaonkar/MD, Plot No. 84, 85 & 86, Tiny Industrial Estate Kondhwa Budruk, Pune Phone- 9822015256 Pincode : 411048 Email : ho@eeplindia.com
132	ELECTROMAGNETIC FLOW METER	SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	Office no. 53, Shree Manoshi Complex, Plot No. 5 & 6, Sec-3, Ghansoli (East), Navi Mumbai, Phone- 9892230623, Pincode : 400 701, Email : sdbpl@vsnl.com



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-III

REV 00

DATE: Dec., 19

SHEET: 1 OF 1

ANNEXURE-III

PAINTING & COLOUR SCHEME

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	in case the system pressure does not drop and compressor continues to idle for more than a pre-set time.			
9.02.04	The control system shall provide warning to the operator that a hot-start condition exists for the motor driver and adequate cool-down period has not occurred after the motor was shut down.			
9.02.05	The alarms and shutdown scheme mentioned below are suggestive and shall be provided as per manufacturer's standard practice meeting the safe operational requirement of the equipment/system each compressor:-			
	(a)	"Air temperature high" at inlet to last stage	Alarm & trip	
	(b)	"Low lube oil pressure"	Alarm & trip	
	(c)	"High Lube oil supply temperature"	Alarm & trip	
	(d)	"High oil filter differential pressure"	Alarm	
	(e)	"Low lube oil level in lube oil sump"	Alarm	
	(f)	"High inlet air filter differential pressure"	Alarm & trip	
	(g)	"Low cooling water flow to air compressor"	Alarm	
9.03.00	Air Drying Plant			
9.03.01	Sequential operation of the adsorber towers & air compressors shall be controlled automatically with a provision for manual take over.			
9.03.02	Change over of tower from drying mode to regeneration mode shall happen automatically if the dew point is high at the outlet of ADP sensed by the dew point (using aluminium oxide probe) meter/sensor. Automatic operation during regeneration, starting and stopping of blowers, starting and stopping of heaters, etc shall be timer controlled. During the process, in case, operation is taken over manually from the panel through push button or selector switch, the sequential operation shall start with the manual initiation for each of the steps.			
9.02.03	The control system shall provide the (as minimum) alarms, "High Reactivation air temperature", "Low Reactivation air temperature", "Low cooling water flow", "Low air pressure at the outlet of ADP" and "High dew point at the outlet of ADP". Adequate number of temperature elements etc. shall be provided for measurement and monitoring of the same.			
9.02.04	For rotary drum type Air drying plant, control philosophy as per manufacture's standard and proven practice is also acceptable.			
10.00.00	PAINTING			
	All the equipments shall be protected against external corrosion by providing suitable painting.			
	The surface of SS, galvanized steel, Gun metal, Brass, Bronze and non-metallic components shall not be applied with any painting.			
	The steel surface to be applied with painting shall be thoroughly cleaned before applying painting by brushing, shot blasting etc as per standard procedure.			
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.:CS-0011-109(3)-9	PART-B SUB-SECTION-I-M3 COMPRESSED AIR SYSTEM	



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-IV

REV 00

DATE: Dec., 19

SHEET: 1 OF 1

ANNEXURE-IV

LIST OF TOOLS & TACKLES

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES		
3.00.00	g) Contractor shall provide microprocessor/PLC/GIU based control system for control and monitoring of ventilation system as per manufacturer's standard practice. Control and monitoring of ventilation system from FGD control system is also acceptable. COMPRESSED AIR SYSTEM a) Two (2) numbers (1 working+ 1 standby) oil free, rotary screw type air compressors for Instrument air and service air applications for FGD plant each of adequate capacity & adequate pressure, with their motor drives and other accessories as per equipment sizing criteria mentioned in Part A, Sub-section 'Salient design data' of technical specification. However, minimum capacity of each air compressor shall be 15Nm³/min at discharge pressure of 8.5 Kgf/cm² (g). b) Two (2) numbers (1 working+ 1 standby) Air Drying Plants (one for each air compressor) of adequate capacity with all interconnecting piping, valves, fittings, etc. c) Two number Air Receiver each of capacity 2 m³ (normal) at the discharge of each Air compressor. d) Monorail with electric hoist of minimum 2 tons or 125% of heaviest parts of equipment to be lifted whichever is more. e) Complete instruments, control system with panels as required for compressed air system. f) Complete compressed air and piping network for service air and instrument air application in FGD system shall be as per Tender drawing of compressed air system. g) Supply of Mandatory spares as specified. h) Any additional items required to make the system complete. 4.00.00 General i. All associated Civil & structural work for air conditioning and Ventilation system and compressed air system. ii. Set of commissioning spares as may be required during erection and commissioning. iii. One (1) set Special tools and tackles required for maintenance of all the Mechanical, Electrical and C & I equipment under the scope of bidder. iv. All steel / cast iron inserts, plates, bolts, nuts, sleeves, metallic-fasteners etc. to be grouted in concrete work and used to hold/ support the equipment/piping / ducting being supplied and erected under this specifications. v. Any additional items required to make the system complete.		
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	<table border="1"> <tr> <td data-bbox="667 1845 1024 1965"> TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-...0011-109(3)-9 </td><td data-bbox="1024 1845 1435 1965"> SUB SECTION-III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM </td></tr> </table>	TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO.:CS-...0011-109(3)-9	SUB SECTION-III-A2 AIR CONDITIONING, VENTILATION SYSTEM & COMPRESSED AIR SYSTEM
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4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-V

REV 00

DATE: Dec., 19

SHEET: 1 OF 1

ANNEXURE-V

DM WATER ANALYSIS

CLAUSE NO.	PROJECT INFORMATION			एनडीपीपी NTPC																																																																						
Table-3 DESIGN CLARIFIED WATER ANALYSIS <table><tr><th>S.No</th><th>Constituent</th><th>As</th><th>mg/l (except pH & turbidity)</th></tr><tr><td>1.</td><td>Calcium</td><td>CaCO₃</td><td>131</td></tr><tr><td>2.</td><td>Magnesium</td><td>CaCO₃</td><td>52</td></tr><tr><td>3.</td><td>Sodium + Potassium</td><td>CaCO₃</td><td>65</td></tr><tr><td>4.</td><td>Total Cations</td><td>CaCO₃</td><td>248</td></tr><tr><td>5.</td><td>Chloride</td><td>CaCO₃</td><td>20</td></tr><tr><td>6.</td><td>Sulphate</td><td>CaCO₃</td><td>93</td></tr><tr><td>7.</td><td>Nitrate</td><td>CaCO₃</td><td>10</td></tr><tr><td>8.</td><td>Alkalinity</td><td>CaCO₃</td><td>125</td></tr><tr><td>9.</td><td>Total Anions</td><td>CaCO₃</td><td>248</td></tr><tr><td>10.</td><td>Iron(total)</td><td>Fe</td><td>0.3</td></tr><tr><td>11.</td><td>Total Silica</td><td>SiO₂</td><td>22</td></tr><tr><td>12.</td><td>pH value</td><td>---</td><td>7.0-8.2</td></tr><tr><td>13.</td><td>Turbidity</td><td>NTU</td><td>10</td></tr></table> Note: Clarified water is used for CW system as make up & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder. Table-4 ANALYSIS OF DM WATER <table><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as SiO2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 to 7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1 µs/cm</td></tr></table>	S.No	Constituent	As	mg/l (except pH & turbidity)	1.	Calcium	CaCO ₃	131	2.	Magnesium	CaCO ₃	52	3.	Sodium + Potassium	CaCO ₃	65	4.	Total Cations	CaCO ₃	248	5.	Chloride	CaCO ₃	20	6.	Sulphate	CaCO ₃	93	7.	Nitrate	CaCO ₃	10	8.	Alkalinity	CaCO ₃	125	9.	Total Anions	CaCO ₃	248	10.	Iron(total)	Fe	0.3	11.	Total Silica	SiO ₂	22	12.	pH value	---	7.0-8.2	13.	Turbidity	NTU	10	Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as SiO2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 to 7.2	5.	Conductivity	Not more than 0.1 µs/cm
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LOT-IA PROJECTS FLUE GAS DE-SULPHURIZATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATIONS SECTION-VI, PART-A BID DOCUMENT NO.: CS-0011-109(1A)-2	SUB-SECTION-II-A11 PROJECT INFORMATION NABINAGAR TPP																																																																							



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-VI

REV 00

DATE: Dec., 19

SHEET: 1 OF 1

ANNEXURE-VI

**DRAWINGS / DOCUMENTS SUBMISSION
PROCEDURE**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS (Annexure-VI)																																																																																													
	<table border="1"> <thead> <tr> <th>S.No</th><th>Description of Drgs/Docs</th><th>No of Prints</th><th>No of ROMs/DVDs/Portable Hard Disk</th><th>CD</th></tr> </thead> <tbody> <tr> <td>1</td><td>Drawings, Data sheets, Design calculations, Purchase specifications and other documents</td><td></td><td></td><td></td></tr> <tr> <td></td><td>First submission and submission with major changes</td><td></td><td></td><td></td></tr> <tr> <td></td><td>▪ Layout (A0&A1 sizes)</td><td>4</td><td>-</td><td></td></tr> <tr> <td></td><td>▪ Other Drawings/Documents (A0&A1 sizes)</td><td>2</td><td>-</td><td></td></tr> <tr> <td></td><td>▪ P&ID (All sizes)</td><td>4</td><td>-</td><td></td></tr> <tr> <td></td><td>a) Final drawings/documents (Directly to site)</td><td>6</td><td>2</td><td></td></tr> <tr> <td></td><td>b) "As Built" Drawing/Documents (Directly to site)</td><td>6</td><td>2</td><td></td></tr> <tr> <td></td><td>c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.</td><td>2</td><td>2</td><td></td></tr> <tr> <td>2</td><td>Erection Manual (Directly to site)</td><td>4 sets</td><td>2</td><td></td></tr> <tr> <td>3</td><td>Operation & Maintenance manual</td><td>1 set</td><td>--</td><td></td></tr> <tr> <td></td><td>i) First Submission</td><td></td><td></td><td></td></tr> <tr> <td></td><td>ii) Final Submission (Directly to site)</td><td>4 sets</td><td>2</td><td></td></tr> <tr> <td>4</td><td>Plant Hand Book</td><td></td><td></td><td></td></tr> <tr> <td></td><td>i) First Submission</td><td>1</td><td>1</td><td></td></tr> <tr> <td>5</td><td>Commissioning and Performance Test Procedure manual</td><td>1 set</td><td>--</td><td></td></tr> <tr> <td></td><td>i) First Submission</td><td></td><td></td><td></td></tr> <tr> <td></td><td>ii) Final Submission (Directly to site)</td><td>4 sets</td><td>2</td><td></td></tr> </tbody> </table>				S.No	Description of Drgs/Docs	No of Prints	No of ROMs/DVDs/Portable Hard Disk	CD	1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents					First submission and submission with major changes					▪ Layout (A0&A1 sizes)	4	-			▪ Other Drawings/Documents (A0&A1 sizes)	2	-			▪ P&ID (All sizes)	4	-			a) Final drawings/documents (Directly to site)	6	2			b) "As Built" Drawing/Documents (Directly to site)	6	2			c) Analysis reports of Equipments / piping /structures components/system employing software packages as detailed in the specifications.	2	2		2	Erection Manual (Directly to site)	4 sets	2		3	Operation & Maintenance manual	1 set	--			i) First Submission					ii) Final Submission (Directly to site)	4 sets	2		4	Plant Hand Book					i) First Submission	1	1		5	Commissioning and Performance Test Procedure manual	1 set	--			i) First Submission					ii) Final Submission (Directly to site)	4 sets	2	
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FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9	PART-C GENERAL TECHNICAL REQUIREMENTS Annexure-VI	PAGE 81 OF 83																																																																																										

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS (Annexure-VI)																																																															
	<table><tr><th>S.No</th><th>Description of Drgs/Docs</th><th>No of Prints</th><th>No of ROMs/DVDs/Portable Hard Disk</th><th>CD</th></tr><tr><td>6</td><td>Performance and Functional Guarantee Test Report i) First Submission</td><td>2 sets</td><td>—</td><td></td></tr><tr><td></td><td>ii) Approved Copies (Direct to Site)</td><td>4 sets</td><td>2</td><td></td></tr><tr><td>7</td><td>Project Completion Report (Directly to site)</td><td>6 sets</td><td>2</td><td></td></tr><tr><td>8</td><td>QA programme including Organisation for implementation and QA system manual(with revisions)</td><td>1</td><td>—</td><td></td></tr><tr><td>9</td><td>Vendor details in respect of proposed vendors including contractor's evaluation report.</td><td>2</td><td>—</td><td></td></tr><tr><td>10</td><td>Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment</td><td>1</td><td>—</td><td></td></tr><tr><td></td><td>ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)</td><td>4</td><td>2</td><td></td></tr><tr><td>11</td><td>Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment</td><td>1 set</td><td>—</td><td></td></tr><tr><td></td><td>ii) Approved copies (Direct to Site)</td><td>4 sets</td><td>2</td><td></td></tr><tr><td>12</td><td>QA Documentation Package for items / equipment manufactured and despatched to site</td><td>2 sets</td><td>2</td><td></td></tr><tr><td>13</td><td>QA Documentation Package for field activities on equipment/systems at site</td><td>2 sets</td><td>2</td><td></td></tr></table>				S.No	Description of Drgs/Docs	No of Prints	No of ROMs/DVDs/Portable Hard Disk	CD	6	Performance and Functional Guarantee Test Report i) First Submission	2 sets	—			ii) Approved Copies (Direct to Site)	4 sets	2		7	Project Completion Report (Directly to site)	6 sets	2		8	QA programme including Organisation for implementation and QA system manual(with revisions)	1	—		9	Vendor details in respect of proposed vendors including contractor's evaluation report.	2	—		10	Manufacturing QPs, Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc i) For review/comment	1	—			ii) Approved final copies of Field QPs, Field welding schedules and their reference document like test procedures, WPS, POR etc (Direct to Site)	4	2		11	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals i) For review/comment	1 set	—			ii) Approved copies (Direct to Site)	4 sets	2		12	QA Documentation Package for items / equipment manufactured and despatched to site	2 sets	2		13	QA Documentation Package for field activities on equipment/systems at site	2 sets	2	
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FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI BID DOC. NO.:CS-0011-109(3)-9	PART-C GENERAL TECHNICAL REQUIREMENTS Annexure-VI	PAGE 82 OF 83																																																												



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-VII

REV 00

DATE: Dec., 19

SHEET: 1 OF 1

ANNEXURE-VII
INSPECTION AND TESTING



TITLE

INSPECTION AND TESTING

REV 00

SHEET 1 OF 2

- 1.00.00 **INSPECTION AND TESTING**
- 1.01.00 Inspection and Tests during Manufacture.
- 1.01.01 The method and techniques to be used by the Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner.
- 1.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.
- 1.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.
- 1.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Bidder may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.
- The owner's representative shall have at all reasonable times access to bidder's or his sub-vendor's premises and shall have power to inspect/ examine materials and workmanship or equipment under manufacture.
- The Bidder shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Further nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere.
- For electrical equipment, routine tests as per relevant IS spec are to be carried out on all equipment. Type tests are also to be carried out on selected equipment as detailed in the specs of concerned electrical equipment.
- 1.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.
- 1.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.
Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to despatch from place of manufacture.
- 1.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material. Equipment or parts coming under any statutory Regulations shall be certified by a Competent Authority under the regulations in the specified format.



TITLE

INSPECTION AND TESTING

REV 00

SHEET 2 OF 2

- 1.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.
- 1.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.
- 1.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnaflex and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major but welding joints shall be radiographed unless otherwise stipulated.
- Statutory payments in respect of IBR approvals including inspection shall be made by the bidder. Bidder's scope shall include to preparation of all necessary documents, co-ordination and follow-up for above approval. Owner shall only forward assistance/endorsement of documents /design /drawings /reports/records to be submitted for approval as stipulated/ required by Statutory Authorities till registration of the unit and clearance for commercial operation.
- 1.02.00 **Performance Tests at Site**
- 1.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Bidder on site under normal operating conditions. The Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.
- 1.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.
- 1.02.03 The Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.
- 1.03.00 For details of specific tests required on individual equipment refer to respective section of this specification.

All Statutory testing / clearance is in Bidder's scope including payment of all fees, etc. as required

ANNEXURE-I

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT :
		ITEM :	QP NO.:	PACKAGE :
		SUB-SYSTEM:	REV.NO.:	CONTRACT NO. :
			DATE:	MAIN-SUPPLIER:
			PAGE: OF....	

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C / N					D*	M	C	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	**	10.		11.

		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS 'W'	 FOR NTPC USE	DOC. NO.:		REV..... CAT.....	
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL	

FORMAT NO.: QS-01-QAI-P-09/F1-R1

1/1

ENGG. DIV./QA&I

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO.:CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENT	
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ANNEXURE-II

SUPPLIER'S LOGO	SUPPLIER'S NAME AND ADDRESS	FIELD QUALITY PLAN		PROJECT :
		ITEM :	QP NO.:	PACKAGE :
		SUB-SYSTEM:	REV. NO.:	CONTRACT NO. :
			DATE:	MAIN-SUPPLIER:
			PAGE: OF....	

SL. NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS OF CHECK #	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	10.

		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. LEGEND TO BE USED: CLASS # : A = CRITICAL, B=MAJOR, C=MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, 'B' SHALL BE WITNESSED BY NTPC ERECTION / CONSTRUCTION DEPTT. AND 'C' SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE NTPC CHP STAGE)	 FOR NTPC USE	DOC. NO.:		REV.....	
MANUFACTURER/ SUB-SUPPLIER	MAIN-SUPPLIER						
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL	

FORMAT NO.: QS-01-QAI-P-09/F2-R1

1/1

ENGG. DIV./QA&I

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.:CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENT	
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ANNEXURE-III

	Project :	Stage :	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL						DOC. NO.:	
	Package :								REV. NO.:	
	Supplier :								DATE :	
	Contractor No. :		SUB-SYSTEM :						PAGE : OF	
S. N.	Item	QP/ Insp. Cat.	QP No.	QP Sub. Schedule	QP approval schedule	Proposed sub-supplier	Place	Sub-suppliers approval status / category	Sub-supplier Details submission on schedule	Remarks

LEGENDS

SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter “A” in the list alongwith the condition of approval, if any.

DR – For these items “Detailed required” for NTPC review. To be identified with letter “DR” in the list.

NOTED – For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with “NOTED.”

QP/INSPN CATEGORY:

CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.

CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.

UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

FORMAT NO.: QS-01-QAI-P-1/F3-R0

1/1

Engg. Div. / QA&I

FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.:CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENT	
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ANNEXURE-IV

	Project : _____		Stage : _____		STATUS OF ITEM REQUIRING QP& SUB-SUPPLIER APPROVAL					DOC. NO.: _____	
	Package : _____									REV. NO.: _____	
	Contractor : _____				DATE : _____		PAGE : _____ OF _____				
	Contractor No. : _____										
S. N.	Item / Service	QP/ Insp. Cat.	QP Sub. Schedule Approval schedule	Date of submission	Date of comm t Appl.	Status Code C/II/I	Proposed Sub-suppliers	Place of manufacturing works	Approval Status	Sub-supplier detail submission schedule	Remarks
FORMAT						1/1		Engg. Div. / QA&I			

STEAM GENERATOR ISLAND PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC.NO.:CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENT	
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4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-VIII

REV 00

DATE: Dec., 19

ANNEXURE-VIII

MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION

MDL FOR CAS PACKAGE FOR 4 X 250 MW NABINAGAR FGD

PROJECT	SURATGARH STPS	PACKAGE-COMPRESSED AIR SYSTEM	NOA DATE				
"A" S NO	"B" VENDOR_DRG_NO.	"D" DRAWING TITLE	"E" PURPOSE	"G" NAME OF BOI	"H" SCHEDULED SUBMISSION (NO. OF WEEKS FROM LOA DATE/SCH PO DATE)(*)	"I" SCH_SUB_DATE (DD-MON-YYYY)	"J" SCH_APPL_DATE (DD-MON-YYYY)
1	PE-V0-463-555-A001	QUALITY PLAN OF AIR COMPRESSOR FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	2		
2	PE-V0-463-555-A002	QUALITY PLAN OF AIR DRYING PLANT FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	2		
3	PE-V0-463-555-A003	QUALITY PLAN OF AIR RECEIVER FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	3		
4	PE-V0-463-555-A004	QUALITY PLAN OF MOTOR FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	3		
5	PE-V0-463-555-A005	TDS OF AIR COMPRESSOR FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	2		
6	PE-V0-463-555-A006	TDS OF AIR DRYING PLANT FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	2		
7	PE-V0-463-555-A007	TDS & CHARACTERISTIC CURVES OF MOTOR FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	3		
8	PE-V0-463-555-A008	TDS & GA OF VALVES FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	5		
9	PE-V0-463-555-A009	TDS OF PIPES & FITTINGS FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	5		
10	PE-V0-463-555-A010	TDS OF INSTRUMENTS FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	5		
11	PE-V0-463-555-A011	GA DRAWING OF AIR COMPRESSOR FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	3		
12	PE-V0-463-555-A012	GA DRAWING OF AIR DRYER FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	3		
13	PE-V0-463-555-A013	GA DRAWING OF MOTOR FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	3		
14	PE-V0-463-555-A014	GA DRAWING OF AIR RECEIVER FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	3		
15	PE-V0-463-555-A015	COMPRESSOR HOUSE LAYOUT	A-CUST	CAS	4		
16	PE-V0-463-555-A016	P & I DIAGRAM OF AIR COMPRESSOR FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	2		
17	PE-V0-463-555-A017	P&I DIAGRAM OF AIR DRYER FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	2		
18	PE-V0-463-555-A018	P&I DIAGRAM OF FGD COMPRESSED AIR SYSTEM WITHIN COMPRESSOR HOUSE	A-CUST	CAS	3		
19	PE-V0-463-555-A019	OPERATION & CONTROL PHILOSOPHY OF FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	3		
20	PE-V0-463-555-A020	ELECTRICAL & INTERNAL WIRING DIAGRAM FOR COMPRESSOR PANEL FOR FGD COMPRESSED AIR SYSTEM.	I-CUST	CAS	2		
21	PE-V0-463-555-A021	ELECTRICAL FEEDER LIST FOR FGD COMPRESSED AIR SYSTEM	I-G-P	CAS	3		
22	PE-V0-463-555-A022	CONTROL CABLE SCHEDULE FOR FGD COMPRESSED AIR SYSTEM	I-G-P	CAS	5		
23	PE-V0-463-555-A023	PG TEST PROCEDURE FOR FGD COMPRESSED AIR SYSTEM	I-CUST	CAS	7		
24	PE-V0-463-555-A024	O&M MANUAL-FGD COMP AIR SYSTEM	I-CUST	CAS	12		
25	PE-V0-463-555-A029	SUB-VENDOR LIST WITH INSPECTION CATEGORISATION PLAN FOR FGD COMPRESSED AIR SYSTEM	A-CUST	CAS	1		



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-IX

REV 00

DATE: Dec., 19

SHEET : 1 OF 1

ANNEXURE-IX

**FORMAT FOR OPERATION AND MAINTENANCE
MANUAL**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
8.03.02	scope of the bidder civil calculation sheets including structural analysis and design alongwith output results. xxvii) Underground facilities, levelling, sanitary, land scaping drawings. xxviii) Geotechnical investigation and site survey reports (if and as applicable). xxix) Model study reports wherever applicable. xxx) Functional & guarantee test procedures and test reports. xxxi) Documentation in respect of Quality Assurance System, and Documentation in respect of Commissioning, as listed out elsewhere in this specification. xxxii) Maintenance schedule for Absorber & auxiliaries clearly indicating interval, duration if shutdown required, manhours required and tools & tackles required for maintenance. The Contractor's while submitting the above documents/ drawings for approval/ reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made.		
	INSTRUCTION MANUALS The Contractor shall make first submission of instruction manual for all the equipments covered under the Contract as per agreed engineering information schedule. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-IV. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following. A) ERECTION MANUALS The erection manuals shall be submitted atleast three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum. a) Erection strategy. b) Sequence of erection.		
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENTS

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	c) Erection instructions. d) Critical checks and permissible deviation/tolerances. e) List of tool, tackles, heavy equipments like cranes, dozers, etc. f) Bill of Materials g) Procedure for erection and General Safety procedures to followed during erection/installation. h) Procedure for initial checking after erection. i) Procedure for testing and acceptance norms. j) Procedure / Check list for pre-commissioning activities. k) Procedure / Check list for commissioning of the system. l) Safety precautions to be followed in electrical supply distribution during erection. B) OPERATION & MAINTENANCE MANUALS a) The manual shall be a two rim PVC bound stiff sided binder able to withstand constant usage or where a thicker type is required it shall have locking steel pins, the size of the manual shall not be larger than international size A3. The cover shall be printed with the Project Name, Services covered and Volume / Book number Each section of the manual shall be divided by a stiff divider of the same size as the holder. The dividers shall clearly state the section number and title. All written instructions within the manual not provided by the manufacturers shall be typewritten with a margin on the left hand side. b) The arrangement and contents of O & M manuals shall be as follows: 1) <u>Chapter 1 - Plant Description</u>: To contain the following sections specific to the equipment/system supplied (a) Description of operating principle of equipment / system with schematic drawing / layouts.			
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENTS		

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	(b) Functional description of associated accessories / controls. Control interlock protection write up. (c) Integrated operation of the equipment alongwith the intended system. (This is to be given by the supplier of the Main equipment by taking into account the operating instruction given by the associated suppliers). (d) Exploded view of the main equipment, associated accessories and auxiliaries with description. Schematic drawing of the equipment alongwith its accessories and auxiliaries. (e) Design data against which the plant performance will be compared. (f) Master list of equipments, Technical specification of the equipment/ system and approved data sheets. (g) Identification system adopted for the various components, (it will be of a simple process linked tagging system). (h) Master list of drawings (as built drawing - Drawings to be enclosed in a separate volume). 2) <u>Chapter 2.0 - Plant Operation</u>: To contain the following sections specific to the equipment supplied (a) Protection logics provided for the equipment alongwith brief philosophy behind the logic, Drawings etc. (b) Limiting values of all protection settings. (c) Various settings of annunciation/interlocks provided. (d) Startup and shut down procedure for equipment alongwith the associated systems in step mode. (e) Do's and Don'ts related to operation of the equipment. (f) Safety precautions to be take during normal operation. Emergency instruction on total power failure condition/lubrication failure/any other conditions. (g) Parameters to be monitored with normal value and limiting values. (h) Equipment isolating procedures.			
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENTS		

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
	(i) Trouble shooting with causes and remedial measures. (j) Routine testing procedure to ascertain healthiness of the safety devices alongwith schedule of testing. (k) Routine Operational Checks, Recommended Logs and Records (l) Change over schedule if more than one auxiliary for the same purpose is given. (m) Preservation procedure on long shut down. (n) System/plant commissioning procedure. 3) <u>Chapter 3.0 - Plant Maintenance</u>- To contain the following sections specific to the equipment supplied. (a) Exploded view of each of the equipments. Drawings alongwith bill of materials including name, code no. & population. (b) Exploded view of the spare parts and critical components with dimensional drawings (In case of Electronic cards, the circuit diagram to be given) and spare parts catalogue for each equipment. (c) List of Special T/ P required for Overhauling /Trouble shooting including special testing equipment required for calibration etc. (d) Stepwise dismantling and assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained etc. Clearance to be maintained etc. (e) Preventive Maintenance schedules linked with running hours/calendar period alongwith checks to be carried out. (f) Overhauling schedules linked with running hours/calendar period alongwith checks to be done. (g) Long term maintenance schedules (h) Consumables list alongwith the estimated quantity required during normal running and during maintenance like Preventive Maintenance and Overhauling. (i) List of lubricants with their Indian equivalent, Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly & at			
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-C BID DOC. NO. CS-0011-109(1A)-2	GENERAL TECHNICAL REQUIREMENTS		

Format for Operation & Maintenance Manual

Project name :

Project number :

Package Name :

PO reference :

Document number :

Revision number :

Sl.no. & Sections	Description	Tick (✓) if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5.1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5.2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5.3	Do's & Don't of the equipments.				
5.4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5.5	Parameters to be monitored with normal values and limiting values				
5.6	Trouble shooting with causes and remedial measures				
5.7	Routine operational checks, recommended logs & records				
5.8	Changeover schedule if more than one auxiliary for the same purpose is given				
5.9	Painting requirement and schedule				
5.10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				

6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	Statutory and other specific requirements considerations.				
8.0	List of reference documents				
9.0	Binding as per requirement				



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : II B

SECTION : E / ANNEXURE-X

REV 00

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ANNEXURE-X

SITE STORAGE AND PRESERVATION

CONTENT

- 1 SCOPE OF THE DOCUMENT
- 2 PURPOSE OF STORAGE & PRESERVATION
- 3 MEASURES TO BE TAKEN FOR STORAGE AND PRESERVATION
 - a) GENERAL STORAGE REQUIREMENTS
 - b) GENERAL PRESERVATION REQUIREMENTS
 - c) GENERAL INSPECTION REQUIREMENTS
- 4 TYPE OF STORAGE FOR VARIOUS EQUIPMENT
5. CONCLUSION
6. STACKING ARRANGEMENT FOR PLATES AND STRUCTURAL STEEL

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

- a. Rust preventive fluid (RPF)
- b. Rust protective paints
- c. Tarpaulin covers, in case of outdoor storage
- d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

- Ingress of moisture and corrosion damages.
- Damage to protective coating.
- Open ends in pipes, vessels and equipment -
 - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

- In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
- Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere. (C)**

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.



ii **Semi-closed storage. (S)**

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.





iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.



The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H ₂ SO ₄)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS, JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

Estelara

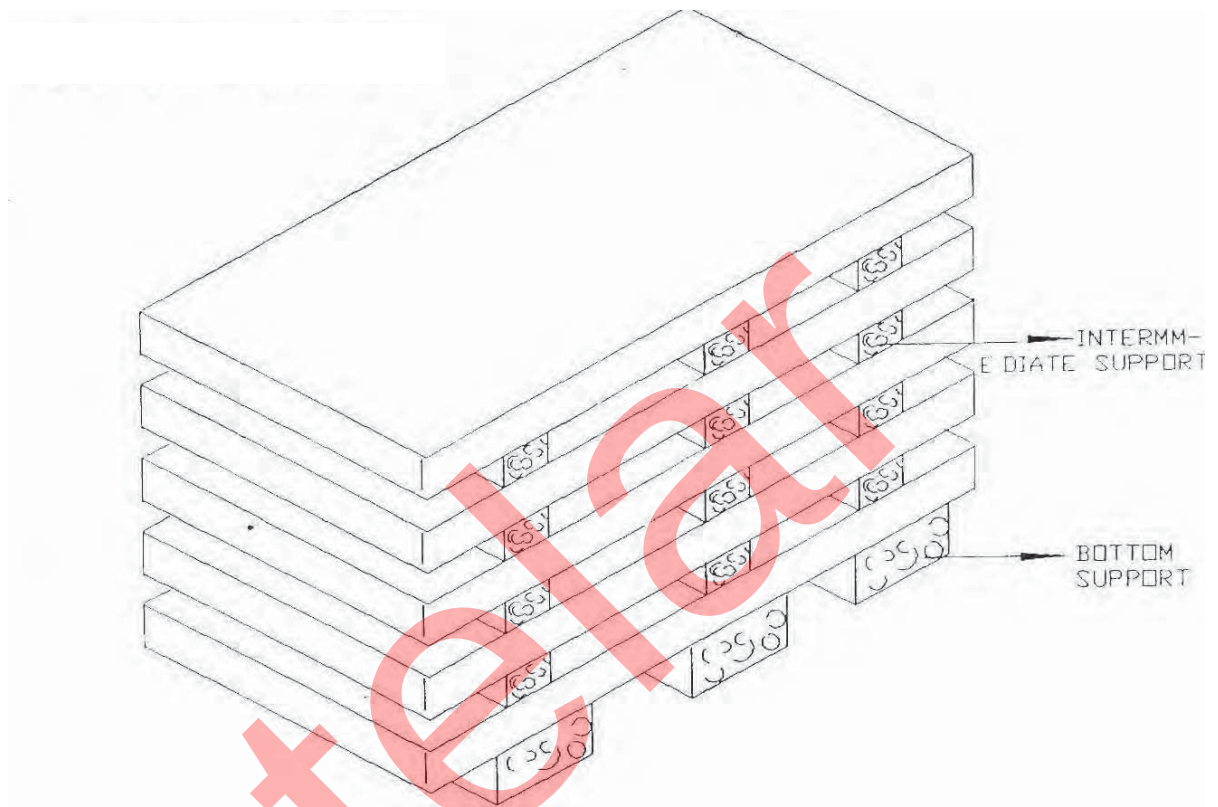


Figure – 1 – PLATE STACKING ARRANGEMENT

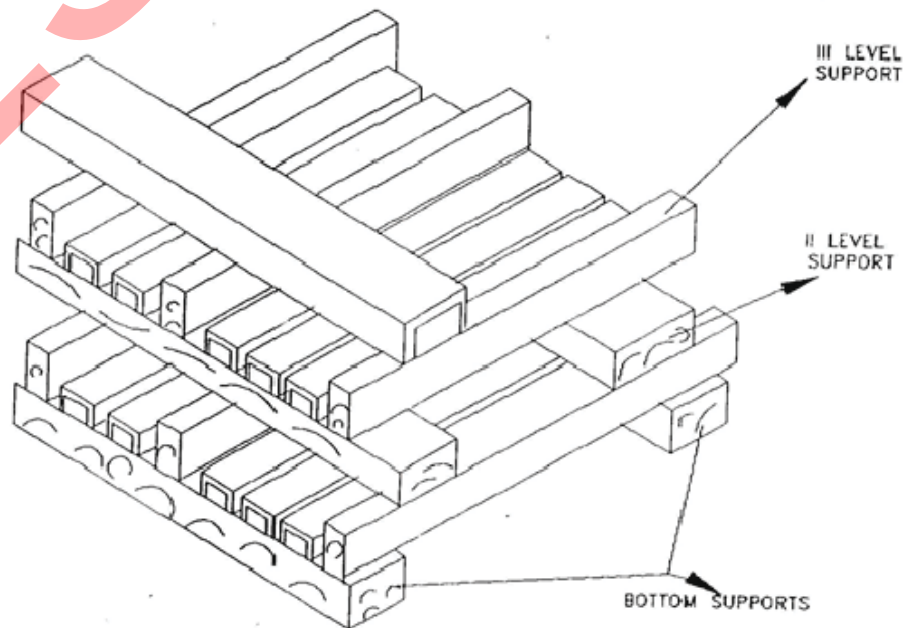


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

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ANNEXURE-XI
PACKING PROCEDURE

	COMPRESSED AIR SYSTEM		
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Packing, Dispatch, Handling & Transportation

- a. All equipment, pipes, valves, instruments, etc. shall be suitably packed for protection against mechanical damages and climatic conditions during transit and storage. Packing and weather proofing shall be subject to approval of the BHEL / his Customer. This approval shall be general and may not be required every time for an article to be dispatched. However, the BHEL reserves the right to examine the packing for any particular consignment at supplier's/ manufacturer's works before dispatch.
- b. The supplier shall be entirely responsible for the insurance, shipment, handling and transportation of all plant & equipment, construction tools, labourers and materials including unloading at destination, transportation to site, off-loading, storing and protection at site till erection.
- c. The equipment shall not be dispatched by the Bidder from the place of manufacture to the site until the dispatch instructions are issued by the BHEL.



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

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ANNEXURE-XII

LIST OF COMMISSIONING SPARES

ANNEXURE- XII

LIST OF COMMISSIONING SPARES (Required for Commissioning of Compressed Air System)

Break up price for COMMISSIONING SPARES

Sl. no	Description	Qty.	Unit	Unit price	Total Ex-Works Prices duly packed	ED	CST	FREIGHT Inclusive Service Tax	Total price FOR SITE
	Oil (To be supplied for all Compressor)	1 Lot							
	Lube Oil Filter (1 set for each compressors)	5 Sets							
	Air Filters (1 set for each compressors)	5 Sets							
	Any other items as per OEM for CAS	1 Lot							
	Total (Rs)								

NOTE -

1. The items indicated in the above list are minimum. Any other spares if required shall be included by bidder in the above list.
2. Any part even though not mentioned in list furnished but required at later date shall be supplied free of cost to BHEL.
3. Bidder to note that the items indicated in the above list shall be provided prior to commissioning of the Compressed air System. If these commissioning spares are already part of compressor / dryer skid. Same need not be considered again.

4 X 250 MW NABINAGAR FGD

TECHNICAL SPECIFICATION

FOR

COMPRESSED AIR SYSTEM

VOLUME-III

(TECHNICAL SCHEDULES)



**BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA-INDIA**



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

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SECTION: 1

**LIST OF DOCUMENTS TO BE SUBMITTED
WITH BID**



4 X 250 MW NABINAGAR FGD

COMPRESSED AIR SYSTEM

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CHECK LIST FOR LIST OF DOCUMENTS TO BE SUBMITTED BY BIDDER ALONG WITH THE BID

SI No.	Item Description	Yes/No
1	Schedules to be submitted dully filled up with bidder's signature and stamp. 1) Technical Deviation Schedule, if any. 2) Signed & Stamped copy of Guaranteed Power Consumption for Compressed Air System 3) Compliance and Confirmation certificate	
2	Resolution to pre-bid clarifications, if any, duly stamped and signed by the bidder enclosed with the bid	
3	Un-priced bid- clearly indicating 'QUOTED' and 'NOT-QUOTED' against each item.	
4	Electrical load List (Volume III - section-4) of technical specification duly filled, stamped and signed by bidder to be enclosed with the bid	
5	Supporting Documents meeting PQR requirements	
6	Offered model of compressor matching FAD calculation, justify selection.	

Please note that all the schedules shall be submitted even though they may not be applicable. Under such circumstances it shall be clearly mentioned across such schedules that these are not applicable.(e.g. in case of there are no technical deviation, it shall be mentioned in the deviation schedule that ' THERE ARE NO DEVIATIONES TO THE TECHNICAL SPECIFICATION').

Name: _____

Signature: _____

Designation: _____

Company: _____

Date: _____

Bidder Stamp



**4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM**

SPECIFICATION NO. PE-TS-463-555-A001

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**VOLUME-III
SECTION 2
COMPLIANCE CUM CONFIRMATION CERTIFICATE**



4 X 250 MW NABINAGAR FGD

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COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.
- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment as applicable, shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant's comments. No extra claims shall be put on this account.
- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.



4 X 250 MW NABINAGAR FGD

COMPRESSED AIR SYSTEM

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- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

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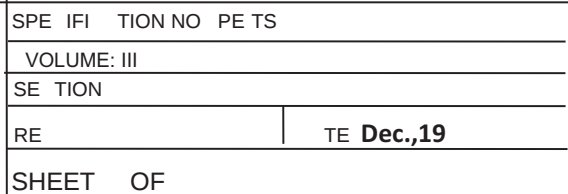
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PRE-BID CLARIFICATION SCHEDULE

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4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

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VOLUME-III
SECTION 4
ELECTRICAL LOAD DATA

RANGE BOUND ELECTRICAL LOAD LIST FOR COMPRESSED AIR SYSTEM																		
LOAD TITLE	RATING (KW)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE (KW)	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Common Compressor (Instrument Air & Service Air) Motor	160		S	1	1	D	U		C		Compressor House							
Common Compressor (Instrument Air & Service Air) Oil pump / cubicle fan (if applicable)	2 – 3.5		S	1	1	D	S		C		Compressor House							
Common Compressor (Instrument Air & Service Air) Control Panel	0.5-1.5		S	1	1	E	S		C		Compressor House						UPS grade supply by C&I	
Air Dryer Panel	0.12 - 0.5		S	1	1	E	S		C		Compressor House							
AUTO DRAIN TRAP	0.3		S	2	0	E	S		I		2 nos. feeder for air receivers outside compressor house.							
NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL) 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED)																		
	LOAD DATA (ELECTRICAL)		JOB NO.		463			ORIGINATING AGENCY				PEM (ELECTRICAL)						
			PROJECT TITLE		4 X 250 MW NABINAGAR FGD			NAME		AMIT GARG		DATA FILLED UP ON						
			SYSTEM		COMPRESSED AIR SYSTEM			SIGN.		-sd-		DATA ENTERED ON						
			DEPTT. / SECTION		MAUX / PF			SHEET 1 OF 1		REV. 00		DE'S SIGN. & DATE						



4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION No: PE-TS-463-555-A001

VOLUME: III

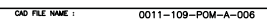
SECTION: 5

REV. 00

DATE: Dec., 19

SHEET 1 OF 1

SECTION: 5
LIST OF DRAWINGS





4 X 250 MW NABINAGAR FGD
COMPRESSED AIR SYSTEM

SPECIFICATION NO. PE-TS-463-555-A001

VOLUME : III

SECTION : 6

REV: 00

DATE: Dec.,19

SHEET 1 OF 1

VOLUME-III

SECTION 6

**Guaranteed Power Consumption for Compressed Air
System**

(To be filled by bidder & be submitted along with offer)

SECTION-6 Guaranteed Power Consumption For Compressed Air System				Doc No:	PE-TS-463-555-A001	
				Rev No:	0	
				Date of issue	Dec.,19	
NAME OF PROJECT:		4 X 250 MW NABINAGAR FGD				
NAME OF PACKAGE:		COMPRESSED AIR SYSTEM				
TECHNICAL SPECIFICATION:		PE-TS-463-555-A001				
S.No. (1)	Description of Equipments (2)	Nos. of Equipments (3)		Total Guaranteed Power Consumption for Each Equipment at Motor Input Terminals & control Panel (4)	Duty Factor (5)	Total (KW) (6) = (3A)*(4)*(5)
		Working A	Standby B			
1	Air Compressors (Oil free Screw type) of capacity 15 NM3/min.	1	1	to be filled by bidder	1.0	to be filled by bidder
2	HOC Air Dyrer of capacity 15 NM3/min.	1	1	to be filled by bidder	1.0	to be filled by bidder
					TOTAL	to be filled by bidder
Note :						
1	Estimated Power Consumption Figure for the compressed air system (For Working Drives Only) considered is 150.5 KW .					
2	Bidders Guaranteed power consumption at motor input terminal at rated duty of Air Compressor considering motor efficiency as confirmed by motor OEM including Air Drying Plant (Heater and Blowers, as applicable) as furnished in guranteed schedule shall be demonstrated by the successful bidder during performance testing at works/site.					
3	The price quoted by the bidder shall be loaded @ \$2129/- for every additional kW increase in consumption from the base figure indicated at Note no. 1.0 above.					
4	In case the successful bidder fails to establish / prove the guaranteed values of power consumption (base figure of auxiliary power consumption or the GPC quoted by bidder, whichever is higher) on actual performance testing at the manufacturing works / site, penalty @ \$2129/- per kW increase in power consumption figure shall be levied.					
5	If the contract currency is other than US dollars, then the liquidated damages shal be in equivalent amount in contract currency based on Bill selling exchange rate of State Bank of India prevailing on the date as on 10.07.2019.					
Particulars of bidder / authorised representative						
Name	Designation	Signature	Date	Date	Company Seal	